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REMARKS

This is a full and timely response to the Official Action mailed April 5, 2005.

Reconsideration of the application in light of the following remarks is respectfully requested.

Claims 1-14 and 16-44 are currently pending for further action. No amendments are made by the present paper.

With regard to the prior art, the final Office Action rejects claims 1-6, 14 and 16-23 as unpatentable under 35 U.S.C. § 103(a) in view of the combined teachings of U.S. Patent No. 6,118,474 to Nayar ("Nayar") and U.S. Patent No. 5,870,135 to Glatt et al. ("Glatt"). For at least the following reasons, this rejection is respectfully traversed.

Claim 1 recites:

A method for generating a selectable perspective view of a portion of a hemispherical image scene, comprising the steps of:  
acquiring an omnidirectional image on an image plane using a reflective mirror that satisfies a single viewpoint constraint and an image sensor;  
defining a perspective viewing window based on configuration parameters;  
and  
mapping each pixel in the perspective window with a corresponding pixel value in the omnidirectional image on the image plane using a look-up table based on the configuration parameters.

In contrast, Nayar fails to teach or suggest the claimed mapping of pixels from an omnidirectional image to a perspective viewing window "using a look-up table." The current Office Action concedes this point and so cites to Glatt. Glatt teaches a system that does not use a reflective mirror to acquire an omnidirectional image, like Nayar. Rather, Glatt teaches a system based on a fisheye lens. According to Glatt "the coordinates are stored in LUT 222 and the corresponding pixels are stored in DPIM 200. This allows the pixels corresponding to those calculated coordinates to be fetched from CCD 180. The fetched pixels are then

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displayed on monitor 240 at locations (X;Y) just as if the image had been formed by the panning and tilting of a normal camera to coordinates (X;Y)." (Col. 8, lines 35-43).

Consequently, Glatt is not teaching the "mapping" of pixels from an omnidirectional image into a perspective window as claimed. Rather, Glatt is merely teaching selecting or fetching specific pixels, without any mapping, distortion correction or other processing, to simulate panning and tilting.

Therefore, a combination of Nayar and Glatt would still fail to teach the claimed mapping of pixels using a look-up table based on configuration parameters as claimed. "To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." M.P.E.P. § 2143.03. Accord. M.P.E.P. § 706.02(j). For at least this reason, the rejection of claim 1 and its dependent based on Nayar and Glatt should be reconsidered and withdrawn.

Moreover, there is no motivation to combine Nayar and Glatt as proposed. Applicant notes that the Nayar and Glatt systems are incompatible; Nayar using a reflector and Glatt a fisheye lens. (*See*, Applicant's specification, paragraph 0004). The LUT (222) taught by Glatt is configured for use with a fisheye lens, not to provide a mapping function, but to provide simulated tilting and panning. The recent Office Action states that it would be obvious to combine the two references to provide Nayar with panning and tilting. However, there is no reason to think that the system designed for a fisheye lens would provide such functionality when used with the reflector of Nayar.

"Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally

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available to one of ordinary skill in the art. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed Cir. 1992)." M.P.E.P. § 2143.01 (emphasis added). "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)." M.P.E.P. § 2143.01. For at least this additional reason, the rejection of claim 1 and its dependent claims should be reconsidered and withdrawn.

Claim 2 recites:

wherein the configuration parameters defined in the defining step include at least one of a zoom distance defined as the distance from the focal point of said reflective mirror to said window, a pan angle defined as the angle between the x axis and a line through the focal point of said reflective mirror perpendicular to the x-y plane and a tilt angle defined as the angle between the x-y plane and a vector normal to said window.

Applicant notes that the claimed look-up table is based on the "configuration parameters." The recent Office Action concedes that Nayar does not teach the claimed look-up table, citing to Glatt. However, the Office Action then argues that Nayar, not Glatt, teaches the configuration parameters. (Action, p. 3). Thus, there is no connection in the prior art between the configuration parameters and the look-up table as claimed. For at least this additional reason, the rejection of claims 1 and 2 should be reconsidered and withdrawn.

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Claim 14, as amended herein, recites:

An improved imaging apparatus for generating a two-dimensional image, comprising:

a reflective mirror configured to satisfy an optical single viewpoint constraint for reflecting an image scene;

an image sensor responsive to said reflective mirror and that generates two dimensional image data signals to obtain an omnidirectional image on an image plane; and

a controller coupled to the image sensor, wherein the controller defines a perspective viewing window based on configuration parameters and maps pixels from said omnidirectional image into said perspective viewing window; and

a memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in a parameter space, said controller using a said mapping matrix to perform mapping of pixels from said omnidirectional image into said perspective viewing window.

(emphasis added).

Claim 14 is thought to be patentable over the prior art combination on Nayar and Gatt for at least the same reasons given above with respect to claim 1. Additionally, the recent Office Action rejected claim 14 as unpatentable under § 103(a) in view of the combined teachings of Nayar and U.S. Patent No. 4,908,874 to Gabriel ("Gabriel"). For at least the following reasons, this rejection is respectfully traversed.

The recent Office Action acknowledges that Nayar does not teach or suggest the claimed memory with a mapping matrix for mapping pixels from an omnidirectional image to a perspective viewing window. Consequently, the Action cites Gabriel. Gabriel, however, teaches a system for performing image transformation in a television system. Gabriel does not teach or suggest anything regarding omnidirectional images and, consequently, cannot teach the claimed memory with mapping matrix for mapping pixels from an omnidirectional image to a perspective viewing window.

Therefore, even if somehow combined, the teachings of Nayar and Gabriel still fail to teach or suggest the claimed "memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in a parameter space, said controller using a said

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mapping matrix to perform mapping of pixels from said omnidirectional image into said perspective viewing window." For at least this reason, the rejection based on Nayar and Gabriel should be reconsidered and withdrawn.

Claims 31-38 and 44 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel and U.S. Patent No., 6,226,035 to Korein et al. ("Korein").

Similar to claim 14, claim 31 recites:

An imaging apparatus for generating a two-dimensional image, comprising:  
a reflective hyperbolic mirror having a hyperbolic cross-section;  
an image sensor optically coupled to said reflective mirror that generates two-dimensional image data signals based on an omnidirectional image reflected by said mirror; and  
a controller coupled to the image sensor, wherein the controller defines a perspective viewing window based on configuration parameters and maps pixels from said omnidirectional image into said perspective viewing window; and  
a memory for storing a mapping matrix for each of a plurality of sets of said configuration parameters in a parameter space, said controller using a said mapping matrix to perform mapping of pixels from said omnidirectional image into said perspective viewing window.

Claim 31 and its dependent claims are patentable over the combination of Nayar, Gabriel and Korein for at least the same reasons given above with respect to claim 14. Therefore, the rejection of claim 31 and its dependent claims should be reconsidered and withdrawn.

Dependent claims 7-9 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar and U.S. Patent No. 5,790,181 to Chahl et al ("Chahl") and U.S. Patent No. 3,988,533 to Mick et al. ("Mick"). This rejection is respectfully traversed for at least the same reasons given above with respect claim 1.

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Dependent claims 10-13 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Glatt and U.S. Patent No. 5,686,975 to Baker ("Baker"). This rejection is respectfully traversed for at least the same reasons given above with respect to claim 1.

Dependent claims 24 and 25 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, Chahl and Mick. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 14.

Dependent claims 26-29 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, and Baker. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 14.

Dependent claim 39 and 40 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, Korein, Chahl and Mick. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 31.

Dependent claim 41-43 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Nayar, Gabriel, Korein, and Baker. This rejection is respectfully traversed for at least the same reasons given above with respect to claim 31.


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For the foregoing reasons, the present application is thought to be clearly in condition for allowance. Accordingly, favorable reconsideration of the application in light of these remarks is courteously solicited. If any fees are owed in connection with this paper which have not been elsewhere authorized, authorization is hereby given to charge those fees to Deposit Account 18-0013 in the name of Rader, Fishman & Grauer PLLC. If the Examiner has any comments or suggestions which could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the number listed below.

Respectfully submitted,

DATE: 5 July 2005


  
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